Evaluating the Efficacy of Online Field-Based Courses: Methodological Insights

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Introduction

Oregon State University (OSU) is a leader in delivering online education, including several natural science field-based programs and dozens of courses with field-based aspects. Natural science field-based learning teaches students to observe, analyze, and outline management actions for broad and complex land areas and natural resources issues. To effectively do this, students must learn how to: 1) make methodical observations using their five senses; 2) collect and analyze data to determine management approaches and methods; 3) use specialized equipment; and 4) engage in discourse with working field professionals to examine and discuss issues and management actions (SERC 2016, Edge & Sanchez 2011, Fedesco & Henares, 2020). Accrediting entities such as the Society of Range Management and The Wildlife Society question the ability of online field-based programs and courses to deliver field-based learning effectively. They cite general differences between in-person and online learning environments and question the ability to effectively convey concepts and skills traditionally taught during field labs and field trips. To the best of our knowledge, no individuals or entities have investigated the pedagogies, methods, and student learning outcome (SLO) achievement between in-person and online learning in field-based disciplines.

This study aimed to undertake such a comparison through an innovative research design focused on rangeland science and fisheries and wildlife sciences courses taught in both online and in-person learning environments. Specifically, the study sought to compare course structure, methods, and student learning outcome achievement in field-based courses between in-person and online learning modalities. As part of the comparison, there was also an aim to identify potential best practices by correlating student learning outcome achievement with both course design and student learning experience.

The execution of this study posed significant challenges that limited results and insights (described in detail on pp. 5 - 6); nevertheless, the study design is potentially useful for others trying to conduct a similar study. Therefore, the study design and methodological insights are the focus of this white paper.

Study Design Overview

The study design was comprised of five inter-related study activities for each course:

1. A course inventory that listed, described, and categorized all course elements (e.g., lectures, activities, readings, assessments, and technology).

2. A course logic model to assess degree of course alignment and content scaffolding. Logic models were created based on learning management system course content, course syllabus, and structure as reported by instructor.

3. A modified Quality Matters (QM) review to assess the degree of student-centered course design and the presence and quality of key structural components. Although the QM process is designed for online courses, its research-based tenets and standards are the foundation for effective teaching practices regardless of learning modality.

4. A student learning experience survey to provide the student perspective of course design and delivery.

5. An evaluation of student learning outcome achievement by two non-OSU reviewers; one working field professional and one academic faculty member. To mitigate potential concerns regarding study objectivity, reviewers were selected from working professionals (i.e., hiring managers of recent graduates) and academic discipline professionals from other teaching institutions. The reviewers were paired with courses based on expertise. Figure 1 on page 3 provides a visual representation of how this study activity was executed.

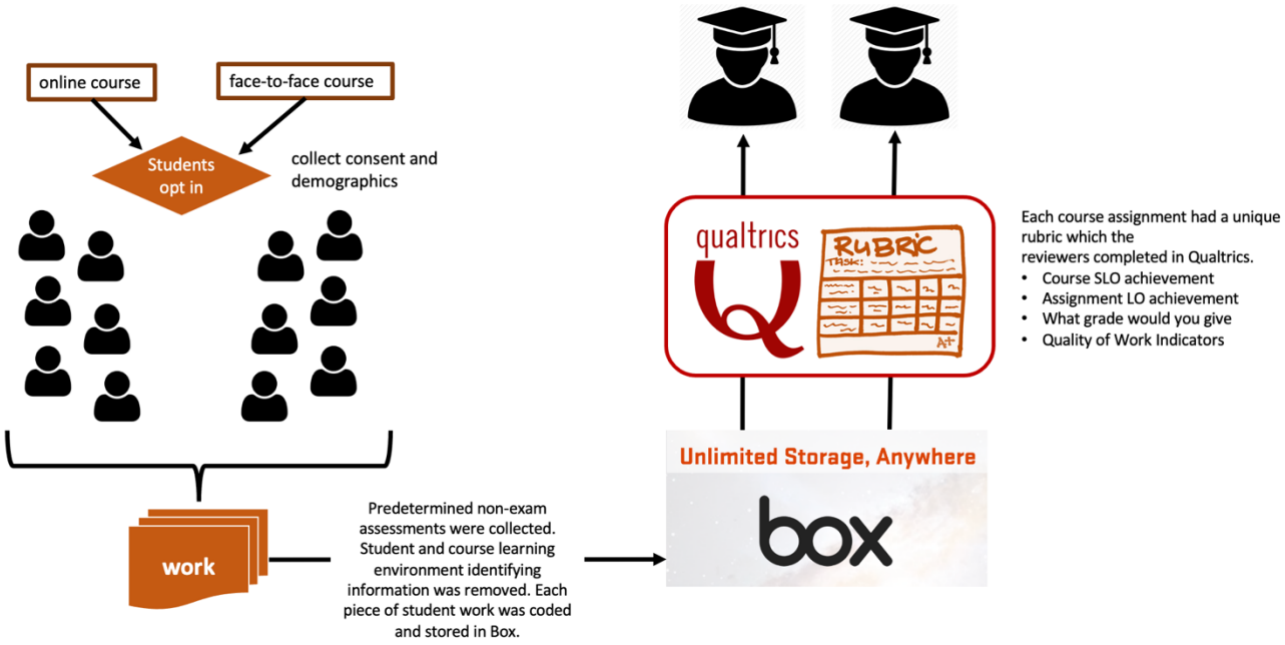

Figure 1: Process for how student learning outcome achievement was evaluated

For each course in each modality, information and data from the first four study activities listed above were correlated to the evaluation of student learning outcome achievement completed by non-OSU teaching faculty and working professionals. This correlation was designed to illuminate factors that may influence the achievement or non-achievement of the student learning outcomes of each course in each modality.

Key Elements of Study Design Implementation

Courses in Study

Four rangeland science (RNG) and four fisheries & wildlife sciences (FW) courses that have substantial field-based components were selected for the study. All four of the RNG courses were core program courses. Although not all the FW courses were core program courses, they are courses taken by most fisheries & wildlife sciences majors. One of the FW courses was a writing intensive course (WIC). Some of the courses were taught by the same instructor, some were taught by different instructors but used the same course design, and some courses were taught by different instructors with different course designs (see Table 1).

Table 1. Participating RNG and FW courses

Course	Number of Instructors	Course Design
RNG 4xx	2	same
RNG 4xx	2	same
RNG 4xx	2	different
RNG 3xx	1	same
FW 3xx	2	different
FW 4xx	2	different
FW 4xx	2	different
FW 4xx	1	same

Participant Recruiting

Instructors of the selected courses were asked by the study principal investigator or the fisheries & wildlife sciences study team member to allow their course to be included in the study. The study design was explained to instructors, and they were assured that all study results would be reported in aggregate.

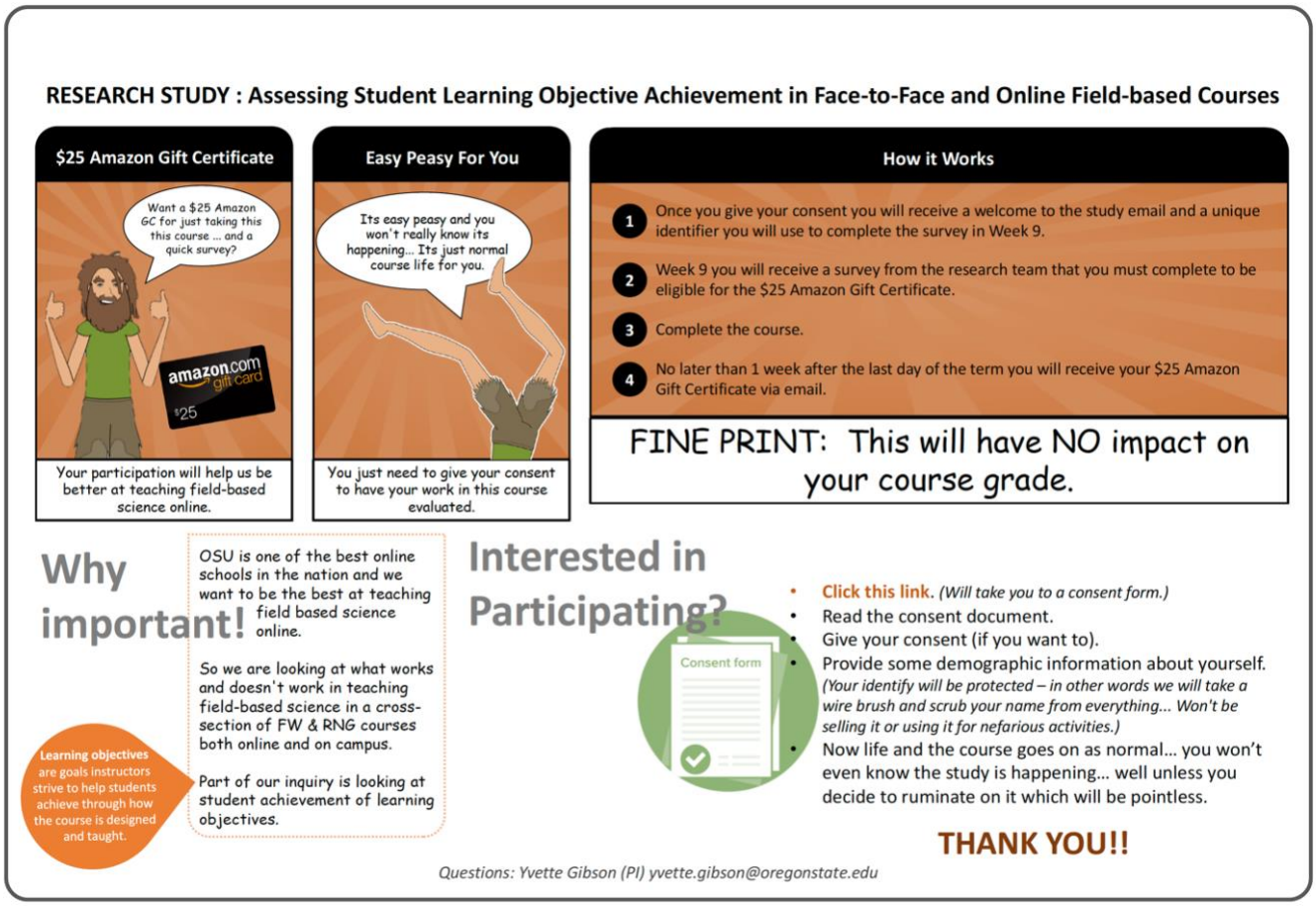

Figure 2. Student recruitment flier emailed to students and posted on online course site

Students were recruited during the first two weeks of the term via an email from the course instructor and a "flier" posted on the online course site (see Figure 2). Students who participated in the study received a $25 Amazon gift card upon completing the course and the student learning experience survey in Week 8 of the term.

Reviewers were recruited via:

Range Science Education Council: Rangeland science faculty from teaching institutions throughout the mid-West and Western US.

Society for Range Management Newsletter: Faculty and working professionals throughout US.

The Wildlife Society Newsletter: Faculty and working professionals throughout the US.

Email list of *Natural Resource Conservation Service, US Fish and Wildlife Service, Bureau of Land Management, and Oregon Department of Fish and Wildlife employees*.

Reviewers who participated in the study received $50 per review item upon completion of the Qualtrics review rubric.

Student Learning Experience Survey

During Week 8 of the term, all students participating in the study provided information about themselves and their learning experience (see Table 2 on p. 5).

Table 2: Sections of the Student Learning Experience Survey

Survey Section 1: Demographics	Survey Section 2: Fieldwork	Survey Section 3: Course Project (If there was a course project.)	Survey Section 4: Course Design & Delivery
• Online or On-campus Student • Major and Standing • Number of prior FW or RNG courses	• Describe in detail course fieldwork • How many hours spent on fieldwork? • Describe how fieldwork influenced your learning experience.	• Describe in detail the course project • How many hours spent on the course project? • Describe how the course project influenced your learning experience.	Rank and describe course instruction and design: • engagement • organization • usefulness of course materials • influence of course assignments on learning • were course learning objectives communicated and how? • self-assessment of learning objective achievement and what in course supported that achievement or non-achievement?

To ensure student anonymity, the Ecampus Research Unit played a critical role in masking the identity of all participants by facilitating all student study activities. The study principal investigator, who was also the instructor for several of the study courses, was not aware of study participant names until after final grades for the term were submitted.

Selection of Student Course Assessments to be Evaluated

The course assessment that best reflected the students' learning outcome achievement was selected based on the course logic model and input from the course instructor. In most cases, this was a summative course project. The two exceptions were each disciplines' species identification courses; these were based on a final comprehensive exam assessing students' ability to identify visual samples of species within a limited timeframe.

Qualtrics Evaluation Rubric

Each student's course assessment was evaluated by one field professional and one academic faculty member from a non-OSU teaching institution. Reviewers completed a Qualtrics survey assessing:

- student's achievement of course-level learning outcomes
- the quality of the student's course project
- the degree to which the student's work demonstrated preparedness for a rangeland science or fish and wildlife job

Finally, reviewers assigned a grade to the student's work on the course project, supported by a short narrative rationale as to the assignment of the corresponding grade.

Study Execution Challenges

Three substantial challenges impeded the study process and prohibited achieving the study objectives.

1. **Reviewers' failure to fulfill role***:* Reviewers were recruited for each course, and some received student work to review, but most reviewers did not complete their reviews, citing lack of time and conflicts with other work priorities. Several reviewers never responded after initially agreeing to participate. Lack of reviewer follow-through truncated the ability to compare SLO achievement between the two modalities of two courses.
2. **Faculty reluctance to participate:** Some faculty members expressed concern about the risks of the study results reflecting poorly on a course in one modality or both modalities and inviting course design input from non-educators. As a

result, the study did not include all desired courses, thus limiting the ability to compare SLO achievement between the modalities of the two courses adequately.

3. **Small sample size for some courses:** The Rangeland Science program at OSU has had fewer on-campus majors in recent years. Two of the in-person RNG courses in the study had very low enrollments during the study period, which resulted in low-to-no study participants for those courses.

Additionally, it was unclear if faculty who agreed to participate posted reminders about the study in the first two weeks of the course, as student participation varied greatly from course to course (low 5; high 31).

General Indications from Limited Data

One-hundred and three *student learning experience survey* responses were received across the duration of the study. Overall, the survey data indicated very few differences reported in the learning experience between the modalities. The limitations of the study prohibit a robust analysis as to the validity of these findings and the identification of underlying and/or correlating context as to why there may be few differences. There are a few results that may be worth examining further:

Hours Spent on Field Work

Students in both modalities reported a similar number of hours spent on field work with a slight increase among students in online courses. The slight difference in time spent may be influenced by how field work instructions and guidance were conveyed to students. Online students were given written instructions to execute independently, while in-person students were given verbal instructions with the instructor present to answer questions and provide guidance.

Possible Further Investigation: Field time is pivotal in field-based courses (SERC 2016, Edge & Sanchez 2011). Understanding nuanced differences of field time and the structure of that time in both modalities could provide insights into best practices of field learning design to benefit both modalities.

Assignments Support Learning

Students in the online courses indicated more often that assignments “mostly” supported learning, whereas students in in-person courses more often indicated that assignments “moderately” supported learning.

Possible Further Investigation: Assignments are a student's opportunity to explore further and apply course content, making them a critical learning point. Examining the underlying nature and mechanics of course assignments may provide insights to strengthen student learning outcome achievement in both modalities.

Effectiveness of Instructor Engagement

Students in the online courses indicated more often that instructor engagement was "very effective," whereas in-person courses indicated instructor engagement was "moderately effective."

Possible Further Investigation: The indication that students in an online course reported a higher level of effectiveness of instructor engagement might not align with conventional beliefs that in-person is more engaging than online. Garnering data on course engagement between the modalities from larger sample size and across a broader range of course designs and instructors may provide insights to refute conventional beliefs and/or insights into best practices of building engagement into the course of both modalities.

The course grade distributions between in-person and online were similar between the modalities. It was not possible to fully assess and evaluate differences in course design between modalities to determine the role of course design in relation to grade distributions between modalities.

The primary weakness of the study execution was the lack of data from the evaluation of SLO achievement by non-OSU reviewers. This activity was purposefully designed to ascertain qualitative assessments of student course work in relation to student learning outcomes by non-OSU academic

faculty, field professionals, and hiring managers of recent graduates. The assessment of student work by these entities could have strengthened the study's objectivity and the associated results by addressing differences or similarities in the efficacy of online versus in-person modalities.

Further, correlating reviewer assessments to course design metrics and the student learning experience could illuminate course design and learning experience strengths and weaknesses, identifying potential best practices in teaching field-based courses.

Study Design Insights and Opportunities

Insight 1: Build a diverse study team
The study team was comprised of one rangeland science faculty member, one fisheries and wildlife sciences faculty member, the Assistant Director of the Ecampus Research Unit, and an Ecampus instructional designer. The diversity of experience and perspectives of this research team served as a case study in itself. Notably, the inclusion of an instructional designer whose expertise in pedagogy, Quality Matters reviews, and instructional design played a critical role in shaping the student experience survey and evaluation rubric.

Insight 2: Re-frame the study: Identify best practices
Instructor reluctance to participate was based on the notion of a "comparison" of modalities. A future study could be reframed to focus solely on the degree of student learning outcome achievement in online field-based courses and correlate achievement or non-achievement to course design and delivery. Courses in this future study could be within online modality only.

Insight 3: Foster a deeper participant investment in the study
The lynchpin of the study was the instructors of the selected courses and the non-OSU reviewers; without them, the study could not be executed and achieve its objectives. The assumption that a stipend would motivate reviewers turned out to be erroneous. A more effective approach may be to create a two-tier research team. Tier One would be the core team of four outlined in Insight 1 above. Tier Two would encompass instructors of selected courses and reviewers. Tier Two would have the opportunity to provide feedback on the study design, participate in quarterly reviews of study execution and preliminary data, and be included in the by-line of any publications of study results.

Insight 4: Broaden study discipline and course selection
Although the rangeland science discipline was a focal point of this study, the OSU's Rangeland Science Program does not have enough on-campus majors to support an adequate in-person sample size for comparison. It would be best to include courses in other disciplines such as soil science, botany, and horticulture to ensure adequate sample sizes in both online and in-person modalities and increase potential to illuminate effective practices in teaching field-based courses online.

Future Directions and Recommendations

Recommendation 1: Apply insights and replicate the study
This study currently has partial data. It could be slightly modified to incorporate the listed insights and fully executed to provide preliminary findings into the efficacy of teaching field-based courses online and begin to illuminate best practices for doing so.

Recommendation 2: Identify and study specific field-based course elements
Field-based courses have several unique characteristics and course design requirements. For example, there is debate over the length and quality of field learning between the online and in-person modalities. Understanding the importance, parameters, and best practices of these unique characteristics and course design requirements may likely strengthen student learning outcome achievement. It is recommended that:

- Faculty who teach field-based courses participate in a process to identify the unique characteristics and course design requirements of field-based courses.
- Studies of several key characteristics and course design requirements of field-based courses be designed and executed.

Recommendation 3: Study novel field-based course design and delivery

The era of Covid-19 and "remote" education has spotlighted the hybrid course model and other novel course delivery models (e.g., short intensive hybrid courses) across field-based disciplines. Faculty are exploring course designs that move traditional in-person classroom learning to the online modality and increase hands-on field-based learning. Within these explorations, faculty are also exploring course designs that integrate students across modalities and geographic locations (in-person, online, branch campuses). These explorations would be well-served by the outcomes of Recommendations 1 and 2, as well as studies crafted to evaluate the implementation and efficacy of novel course delivery.

This study was conceived, crafted, and attempted in the 2018 – 2019 academic year. Today in 2022, there remains a lack of published research examining any aspects of teaching field-based natural science courses online. Yet, there is an increasing number of field-based programs and courses coming online at both the post-secondary level and the professional development level. The principal investigator of this study has developed and is currently delivering online field-based courses for the USDA Natural Resource Conservation Service, the Bureau of Land Management, and the National Grazing Lands Coalition. There is a need and a research opportunity to inform the debate over whether online field-based courses can be effective, as well as best practices for optimal efficacy.

References

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About the Research Unit at Oregon State Ecampus

Vision

The Ecampus Research Unit strives to be leaders in the field of online higher education research through contributing new knowledge to the field, advancing research literacy, building researcher communities and guiding national conversations around actionable research in online teaching and learning.

Mission

The Ecampus Research Unit responds to and forecasts the needs and challenges of the online education field through conducting original research; fostering strategic collaborations; and creating evidence-based resources and tools that contribute to effective online teaching, learning and program administration.

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Suggested Citation

Gibson. Y. (2022) *Evaluating the efficacy of online field-based courses: methodological insights*. *White Paper.* Corvallis, OR: Oregon State University Ecampus Research Unit.